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in Developing Countries

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Postal Address: Box 8500, Ottawa, Canada K1G 3H9
Head Office: 60 Queen Street, Ottawa

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Proceedings of a workshop on training held in Lobatse, Botswana, 14–20 August 1980

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Disease Transmission

G.P. Malikebu[1]

Man is the reservoir of most of the diseases that destroy or incapacitate him. Diseases such as cholera, typhoid and paratyphoid fevers, the dysenteries, infantile diarrhea, hookworm diseases, ascariasis, bilharziasis, and other similar intestinal infections and parasitic infestations are the cause of tremendous losses of life and debility.

Unsanitary disposal of faeces and urine is one of the most common sources of infection. Disease germs leaving the body pass back into food or water via flies, which carry the filth on their legs and contaminate food; dust, which is blown about; water, passing over contaminated ground; and the hands of those who handle food.

In the transmission of these diseases from the sick or from carriers to the healthy person, the chain of events may be summarized as follows: the excreta (focus of infection) is transmitted via hands, water, insects, or soil onto the food and/or drink of the healthy person, who then contracts the disease and becomes debilitated or dies.

Cholera

Cholera is an intestinal disease characterized by sudden onset, and profuse watery stools and vomiting resulting in rapid dehydration. Death occurs within a few hours of the onset. Cholera is one of the pestilential diseases.

[1]Acting Principal (School of Hygiene), Ministry of Health, Zomba, Malawi.

Mode of Transmission

The causative organism of cholera leaves the body of the victim in the faeces and vomited material. Infection may be transmitted from person to person directly as a result of handling patients or handling infected material, or by flies that have landed on the faeces or vomited material and then landed on food. The chief vehicle of transmission during epidemic outbreaks is contaminated water supplies. Cholera germs have to be ingested and there is a high mortality in untreated cases.

Malawi Experience

In Malawi, the first cholera outbreak occurred in September 1973. The very first case was that of a person who attended the funeral of a relative in neighbouring Mozambique. Not knowing that the cause of death had been cholera, the person, upon return to his village, developed diarrhea and subsequently died from severe diarrhea and vomiting. Because the people of the village had never seen a case of cholera before they did not become alarmed until several neighbours developed similar symptoms and died. By the time it was positively diagnosed as cholera, several lives had been lost.

During the first days of the outbreak, everybody was concerned with treatment. Preventive measures were not emphasized until World Health Organization (WHO) experts arrived to help. The chain of transmission had to be revealed and the source of infection established.

The factors that had to be studied were: (1) cholera is transmitted by ingesting

through the mouth (via food, drink, or other material) vibrio cholera or cholera organisms from the faeces or vomitus of a victim; (2) at a funeral there is a lot of food cooked and communal eating; (3) hands are used for eating and everybody washes their hands in the same bowl no matter how dirty the water becomes; (4) food is rarely covered because it is served and prepared in large containers; (5) drinking water is never boiled or treated in any way; and (6) the number of latrines is negligible or nonexistent in many villages. When all of these factors are considered, it is no wonder that the cholera outbreak became an epidemic within a short period of time.

In an effort to contain the epidemic, the following policy was drawn up and followed:

(1) Effective treatment of cases. Quick rehydration (with Ringer's lactate) and the proper dosage of broadbase spectrum antibiotics (e.g., tetracycline hydrochloride).

(2) Contact tracing and prophylaxis. All persons coming in contact with a cholera victim had to be traced and given prophylactic treatment. This measure was used to check if others within the family were carriers.

(3) Restrict movement. The infected districts were placed on quarantine and anyone leaving the infected area had to receive prophylactic treatment.

(4) Mass vaccination. The people within infected districts were vaccinated en masse, but soon it was discovered that some of those people vaccinated developed cholera.

(5) Health education. This was carried out by health personnel, politicians, regional religious leaders, and traditional leaders. To bring the information to the people, leaflets were printed explaining what cholera was, the signs and symptoms of the disease, how it is transmitted, and how to prevent it. The leaflets were printed both in English and Chichewa.

(6) Short-term control measures. In order to prevent the spreading of the disease, precooked foods sold in open markets were prohibited, all local markets were inspected daily for cleanliness and any nuisances found were quickly abated, and domestic water supplies were chlorinated by a team of cholera assistants that was recruited to supervise the pot-to-pot chlorination of the water.

(7) Long-term control measures. As stated earlier, cholera organisms infect the human being through the mouth, leave the body in the faeces, and are transmitted through the agency of flies, water, food, and hands. It was resolved, therefore, that a latrine-building program be launched together with efforts to improve sanitary conditions within villages.

In implementing the program, it was generally agreed that the local people should become involved. They had seen the results of cholera and were ready to accept any measure introduced to prevent further cholera outbreaks. This marked the birth of health committees. The main job of the health committee was to see to it that every household had and used a latrine.

In villages with a high percentage of latrines it was found that once the health committee control teams began overseeing the usage of the latrines, it did not take long before the situation returned to normal. In villages with a low percentage of latrines, however, it was very difficult to contain the outbreak. It was not until the number of latrines increased that a decline in the number of cases was noticeable.

It was also observed that the most dangerous element in the transmission of cholera was the carrier state. This was discovered by one of the WHO experts who was carrying out cholera surveillance in one part of the country. A carrier is a person who contracts the disease and does not develop the signs and symptoms of the disease, but can infect others.

In a village where there are no latrines, flies will carry the vibrio cholera organisms from the faeces that a carrier has deposited on the bare ground and deposit them onto the food of susceptible villagers, thus causing an outbreak. If a person who has come in contact with a cholera victim is swabbed for laboratory testing, it can be determined whether or not the carrier is cholera positive. Thus, it was ruled that anyone coming in contact with a cholera

victim should be swabbed and laboratory tested as soon as the first case appears within a locality so that the sources of infection can be established quickly (e.g., if the carrier had a latrine, the infected faeces would not be exposed to flies, storm water, etc., and the disease could be contained easily if it was found to have affected only the family of the carrier).

Bilharziasis (Schistosomiasis)

This disease is characterized by inflammation of the bladder, the passage of blood in the urine, ulceration of the wall of the rectum, and the passage of blood and mucus with the stool.

Mode of Transmission

The male and female adult worms associated with this disease live in the veins of the bladder and rectum. The female lays her eggs in enormous numbers in these veins and the eggs penetrate the bladder and rectum walls finding their way out in the urine and faeces. If the faeces are deposited on dry ground the eggs soon die, but if they reach water they hatch almost immediately, releasing small embryos called miracidia. These swim about in the water searching for an intermediate host, a specific type of snail. If no snail is found they die in about 1 day, but if they meet a suitable snail they bore into it and undergo a complete change. They emerge as cercariae. These swim about in the water and enter the human skin once in contact with it. Thus, once they penetrate the skin the person is infected. The heads of the cercariae find their way through the tissues to the portal vein, where they develop into adult worms. When mature, they copulate and the female begins the life cycle again by producing vast numbers of eggs. The complications associated with this highly debilitating disease are anaemia, ascites, malnutrition, and sterility.

Malawi Experience

In Malawi, at present, there is a national bilharzia project in progress. The following discussion, however, will deal with one of the pilot projects at the Kasinthula irrigated rice scheme.

The project started in 1975 for the purpose of increasing the production of rice and, therefore, the income of the farmers. Soon after the establishment of the scheme, it was discovered that the largest number of patients coming to the outpatients department were suffering from bilharzia. The program, therefore, began a survey of the entire scheme for: (1) the presence of snails; (2) the infectivity of humans; and (3) the infectivity of snails. Once all three were established, control measures had to be implemented. The control measures adopted were: (1) all infected persons had to be treated; (2) health education programs had to be launched; (3) public pit latrines had to be provided for use by small landowners; and (4) molluscicides were used in the entire canal complex.

The infection rate at the scheme was found to be 80%. After all four measures were jointly implemented, the incidence of the disease dropped drastically. After 3 months the infection rate was well below 30%. Now, the infection rate is less than 20%. The results at Kasinthula have been so impressive that new irrigation schemes are being launched with the bilharzia program included.

The provision of latrines at the Kasinthula rice scheme was welcomed by the farmers, but the distance one had to go in order to urinate was a problem. This prompted fouling of water courses with urine, thus connecting the chain of transmission. As mentioned earlier, this is the most direct method of bilharzia transmission. A method, therefore, had to be found to cater to urination. In this regard, the project staff devised a simple form of urinal for use on the scheme. The closer proximity of these urinals encouraged their use and eliminated the need for a long walk to the latrine.

There are several factors that influence bilharzia transmission in Malawi: (1) bilharzia is so endemic that for one to go for treatment the disease must have reached such a chronic stage that complications have

set in; (2) bathing and swimming in bilharzia-infected bodies of water, by both adults and children, are very common; (3) it takes a long time to complete the course of treatment currently being administered for bilharzia and owing to its side effects many patients do not complete the treatment; and (4) drinking of untreated water from infected sources is common.

Hookworm (Ankylostomiasis)

Ankylostomiasis is caused by flatworms. They are parasitic and live in the intestines of humans. They suck blood, which leads to anaemia, breathlessness, wasting, swelling of the feet, and mental lethargy.

Mode of Transmission

The adult worms live in the intestines of humans. They produce eggs that are passed from the body in the faeces. The eggs, if deposited on warm and damp soil hatch in 1–2 days. The larvae feed upon the faeces and develop. After some time, they mature and cling to the damp earth or wet grass until bare human skin touches them. They penetrate the skin immediately and get into the lymphatic vessels and to the circulatory system and they enter the lungs. They are then coughed up and swallowed, thereby entering the stomach and the small intestines, where they cling and start the blood-sucking process over again, producing toxic substances. The female worms, when fertilized, pass eggs into the gut in enormous numbers, and these are again passed from the body in the faeces.

Malawi Experience

The factors that influence hookworm transmission in Malawi are: (1) because Malawi is an agricultural country, farmers are always in contact with infected soil; (2) there is a lack of pit latrines and wastes are not disposed of in a sanitary manner; and (3) treatment is not sought until it is too late.

There are no specific programs dealing with hookworm diseases in Malawi but health education topics do include hookworm, particularly at under the age of five clinics and prenatal clinics.

Before the cholera outbreak, hookworm and bilharzia were the two diseases that were being used to advocate the building of latrines in Malawi. It was difficult for a village to see the dangers of bilharzia and hookworm but at the mention of cholera, everyone realized that there was danger.

As mentioned earlier, excreta is the main cause of infection and through different agencies humans are infected by a multitude of diseases. It is important, therefore, that economical means of breaking the chain of transmission be developed without violating the social or cultural views of the communities to be served.